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AUTHOR Dede, Christopher; Gottlieb, David
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ABSTRACT

The social role of the personal computer and its implications for familial health were investigated in a study of approximately 100 families with microcomputers in their homes. Data were collected through a written questionnaire and through diskettes programmed to monitor day-to-day computer usage. Analysis emphasized both patterns in family use of the microcomputer and the effectiveness of diskettes as an experimental method for data collection and analysis. Computer uses were categorized as entertainment, education, work, communications, word processing, programming, and household management, with most usage falling in categories related to occupational interests. Users tended to spend 30 minutes to 2 hours in each computer session, to underestimate the amount of time that would be spent, and to wish for more computer time. Major activities replaced by computer use did not involve social interaction. All participants were generally enthusiastic about the computer and felt its impact on their lives had been positive. Families classified as single-user dominated and group-dispersed seem generally similar in all aspects measured. Results also indicated that use of diskettes seemed to be less expensive than other methodological approaches and provided a convenient means of recording data on each computer session at the time, if subjects were willing and remembered to answer the questions. (LMM)

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THE LONG-TERM INFLUENCE OF HOME MICROCOMPUTERS ON FAMILY/SCHOOL RELATIONSHIPS

Dr. Christopher Dede
UH/Clear Lake
Houston, Texas

Dr. David Gottlieb
UH/Univ. Park
Houston, Texas

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INTRODUCTION

The use of microcomputers in American homes is likely to have significant long-term consequences for family interaction patterns, including those linked to learning. The best historical analogy to document this assertion is television. Three decades after the television first became a part of family life, individual values and social interaction have dramatically altered because of its influence. Many of these shifts have pathological aspects, indicating the subtle and unobtrusive power that a frequently used education/entertainment device can exert.

In all probability, microcomputers will also have major impacts on individual values and familial dynamics, if these devices are used for appreciable amounts of time each day and if they alter the user's cognitive and affective domains. Both of these criteria are likely to be met within the next few years for many families, as the variety and sophistication of software marketed continues to increase and as the price of powerful machines keeps dropping.

In fact, the microcomputer may eventually have a more far-reaching effect on its users than the television (or any other communications technology). Small computers are interactive devices; the user is not a spectator, but a participant, a shaper, a creator. This opportunity to design and control one's own universe is very attractive to most people, especially given that many feel as if they have little power over their lives and their interactions with others.

As adults and children spend time (together or alone) working with these devices, this may substitute for time now expended in other activities, many related to school or learning. Determining the new dynamics that emerge with the presence of a home microcomputer and assessing the long-term impact of any substitutions of activities that occur is an important first step to minimize negative consequences and maximize educational benefits of these devices.

RESEARCH ON HOME MICROCOMPUTERS

In November, 1982, the authors were funded by the Hogg Foundation for Mental Health to conduct a study on "The Social Role of the Personal Computer: Implications for Familial Mental Health." The methodology for this study involved identifying a sample of approximately one hundred families with microcomputers in their homes. The researchers constructed a written questionnaire to gather background data about this sample's demographic characteristics and reasons for acquiring a personal computer. A protocol was prepared for monitoring day to day computer usage, and diskettes programmed to collect this data were distributed to the subjects. Finally, all this information was analyzed to see what overall patterns emerged. This section of the paper describes how each of these methodological stages was conducted.

Identification of Sample

The goal of the researchers in finding a sample population was to locate approximately one hundred families willing to provide demographic data and information on their computer usage patterns. One hundred seemed an appropriate number since this would allow for substantial attrition while still retaining a reasonable statistical base. (For the purposes of this study, "family" was defined as a group of two or more people living together in a legal relationship.) No effort was made to ensure that this sample was representative of the larger population either of families owning computers or of American families in general. While making the research results more generalizable, such an identification effort would have involved considerably more time and funding. For preliminary research such as this, that degree of rigor did not seem indicated.

Potential sources of families with computers included all major groups of computer users in the Houston metropolitan region. (Limiting the search for participants to this area ensured a closer contact between the researchers and the subjects if difficulties arose in the data collection phase, without making the sample significantly less representative.) The major groups identified were:

1) clients of stores selling personal computers
2) students attending computer classes at area universities
3) people engaged in informal learning experiences connected with computer usage (e.g. those taking a "course" at a computer store or at a non-credit "class factory")
4) members of computer users groups

5) attendees at computer related conferences, especially those targeted to home consumers

Other sources of users were personal acquaintances of subjects in the study, parents of children whose teachers knew they had home computers, and volunteers who heard about the study from the media or from presentations given by the researchers.

A limitation on potential subjects was the requirement that each family in the study have an Apple microcomputer with a disk drive. (This restriction was imposed by the methodology utilized to collect data on usage, as will be discussed later.) Since owning such a computer system involves an expenditure of at least $1500, families purchasing an inexpensive computer as an unusual toy or as a means to play arcade games were not included in the sample. While making the sample families somewhat less representative of the overall population of families using computers, this limitation likely had little effect on the results of the study. Most computer applications likely to involve significant long term amounts of family time (record keeping, educational, business, or technical uses) require the use of a disk drive and, of all such systems, Apple is the most widespread.

In soliciting potential subjects from these groups of computer users, a variety of methods was used. One page announcements of the study were distributed at conferences, in classes, and in computer stores. The two graduate assistants made personal appearances at meetings of different groups to ask for volunteers. Brief descriptions of the study, asking for potential subjects, were placed in local newsletters which might have substantial numbers of computer users among their membership. Likely prospects identified by others were phoned to ask for their participation. Owners of computer stores were asked for mailing lists of their customers to whom announcements of the study could be sent.

In all cases, the guaranteed anonymity of subjects and their freedom to cease participating in the study at any time were stressed. To ensure that all ethical precautions appropriate to the research were being followed, the entire plan for the study, including all protocols, was reviewed and approved by the Human Subjects Committee of the University of Houston--University Park prior to the solicitation of subjects.

Of all the groups from which potential subjects were drawn, the Houston Area Apple Users Group (HAAUG) was most productive. Since the membership of this group all own Apple microcomputers, this outcome was not surprising. Perhaps five percent of this total organization became involved as

participants in the study. Other reasonably fruitful sources were acquaintances of those already involved in the study and faculty and students in the University of Houston system who heard about the study. Distribution of brochures at conferences or classes and the use of computer stores to target likely volunteers were the least productive sources of subjects.

Subjects were identified and added to the study over a period of some seven months. The total number of subjects who agreed to participate and were given a questionnaire and diskette totalled 98. At this point, the time available for the study necessitated an end to solicitation. No attempt was made to replace subjects who discontinued their participation in the study.

Questionnaire Preparation

A written questionnaire to collect background data about the sample families was constructed. This protocol had several purposes:

a. to collect demographic data about the family and its members
b. to ascertain the process by which the family acquired a home computer and the nature of the system purchased
c. to determine the expertise of family members in computers before the purchase was made and their attempts to gain greater expertise since then

This questionnaire required about fifteen minutes of the time of one family member to complete.

Questions 1, 2, 3, 4, 5, 8, and 9 on the instrument ask for information about the decision to purchase a home computer. Emphasis is placed on the timing of the decision, the rationale for the purchase, barriers to acquisition, the role of other people in giving advice, the degree to which written information was used in making the choice, and the nature of the system finally purchased.

Questions 6, 7, 10, and 11 on the instrument are targeted to ascertaining the family's expertise with computers. The computer experience of various members of the family before the decision, the computer training they had received prior to the purchase, educational experiences subsequent to selection of the system, and attempts to gain information through computer related publications are stressed.

The background questions at the conclusion of the questionnaire focus on demographic characteristics of the household. These include names and ages of family members,

years of formal education and marital status of the respondant to the instrument (the primary contact within the family), the employment of family members, and the family's overall income. Ascertaining the membership of the family is particularly important in determining, via the data collection diskette, which family members have no interaction with the computer.

Subjects were given (or mailed) this instrument after indicating a willingness to participate in the study and simultaneously with their receipt of the diskette for data collection. The contact person in the family was urged to complete the questionnaire promptly and return it by mail. Forty percent of the sample did return the instrument quickly, another third did so after prompting by phone. A fourth never completed the questionnaire.

Gathering Data Via Diskette

To determine the family interaction patterns created by computer usage, a detailed record of the activities of each user is required. Collecting such data inevitably requires self-report, as an outside observer placed next to the computer would be both expensive and obtrusive. (Long term, one can imagine a computer automatically programmed to collect and store this data internally, reporting to the experimenters each day via phone, but this is beyond current state of the art.) Such self report is most likely to be accurate if done at the time of computer usage (since memory is unreliable) and in as easy a form as possible (since users will tend to avoid cumbersome or timeconsuming reporting activities).

The researchers utilized an experimental methodology to determine, as one goal of the study, its possible effectiveness as a social science data gathering approach. Subjects were given (or mailed) a diskette and an instruction sheet for its use. Each family member was asked to insert the diskette and answer a few brief questions before every usage of the computer and again after that session on the machine was completed. The diskette automatically stored the answers to the questions, thus eliminating the necessity for subjects to keep any written record.

Such an approach to data collection offers several potential advantages. The subjects record their actions and responses at the time of usage, rather than later when memories have faded. Participants are not required to fill out, store, and return the bulky paper questionnaires needed for an equivalent amount of recordkeeping. The cost of such a procedure is much lower than, say, having the subjects phone a researcher before and after each usage to report their actions and feelings. The data are gathered in an

impersonal and reasonably unobtrusive manner unlikely to produce bias in subject response.

The method also has potential weaknesses, whose importance the research was designed to elicit. Subjects may forget to use the diskette either before or after computer usage (or both), thus making the records less accurate. Participants may become bored with answering the diskette questions (necessarily a non-reinforcing activity, as a data collecting procedure highly rewarding to subjects would bias the usage patterns) and may then not record sessions or may withdraw from the study. The data on the diskette may be damaged or destroyed through inadvertant actions by some member of the family. (Of course, with the possible exception of the latter, all of these possible weakness also apply to more conventional forms of data collection such as repeated questionnaires.)

To prepare the diskette, a computer programmer was engaged to develop software which would ask users questions and store results. This necessitated the preparation of two programs: one on the user diskettes to manage the collection and recording of data, the other for the experimenters to retrieve information from the user diskettes. The program on the user diskette was compiled (translated into machine language) and protected from user manipulation so that the data entered could not be retroactively altered or viewed by another family member.

Unfortunately, user error could erase the contents of a diskette, since the only method for ensuring against this eventuality (write-protecting) also blocks the diskette from storing any data. Precautions were therefore taken to minimize the chance for data to be lost or damaged. The diskettes were mailed to users in a heavy duty cardboard enclosure designed for this type of media. Participants were requested to use these enclosures for storage and in returning the diskettes to the researchers. Each diskette was clearly labeled, and the instruction sheet enclosed offered suggestions for proper care. Subjects were provided phone numbers to use if any difficulties were encountered and encouraged to call the researchers if any questions arose.

The software on the user diskette was programmed to note when the diskette was becoming full of data and then to ask the subject to contact the researchers for instructions. In this manner, the chances of information being lost because the diskette could hold no more data were minimized. The collection format was designed such that each diskette could hold reports of about 120 sessions, so the need to supply additional diskettes for recordkeeping was kept to a minimum.

The Protocol on the Diskette

A fixed set of questions was asked of participants before and after each session on the computer. The goal of this data collection procedure is to determine:

a. which family members are using the computer
b. what social interactions take place around determining who uses the machine
c. the user's purpose in interacting with the computer
d. the activities with which computer utilization is competing
e. the time involved in usage
f. the user's feelings about all aspects of working with the machine

Provision is also made for open-ended responses by the participant to add any other information he or she wishes to convey.

In the Before Session questions, the user is identified and the names of co-participants (if any) are solicited. The date and current time are entered; the former to give a cumulative sense of frequency of use, the latter as one of a series of questions to determine actual elapsed time on the machine versus user perceptions of time. The subject is asked for what duration computer usage is planned and the purpose of the session. As a cross-check, the names of the software packages the participant is intending to use are ascertained; these can be compared to the intended purpose stated. Finally, the subject is asked in what activity he/she might be engaging if not using the computer.

In the Post Session questions, the user and date are again identified (in case some participant forgot the Before Session questions). The current time is determined (to compare to the time the session was initiated), and the user is later asked to estimate the time involved in this session (to compare user perceptions to actual elapsed time and as a record if the Before Session questions were inadvertantly omitted). The software packages used are ascertained; from this information, the actual purpose of the computer usage can be determined and compared to the originally intended usage. Subjects are asked if anyone tried to join (or take over) their use of the computer and how they responded. Difficulties in computer functioning and feelings these caused are queried.

A series of questions is asked dealing with whether users wished more time with the computer (and why they were stopping if so) or less time with the computer (and what they would have liked to do instead). Open-ended responses on feelings about the computer and the activities with which

it competes are solicited. Finally, the subject is asked if he/she would like to add any other information.

To maximize the probability of data being entered properly by subjects, the program administering the questions was instructed to reject certain types of inappropriate input. For example, when the user was asked to enter his/her name, the computer was programmed to reject a "null" response (the participant simply typing the return key to move on to the next question without answering). A response of minimum length was required of the user before the computer would continue. Similarly, when asked for the time, alphabetic characters were not accepted; the respondant had to input a number. In this manner, subjects were prompted to take the questions seriously and to give appropriate answers. (Of course, for all open-ended questions, no user response was required to continue with the protocol.)

Participant Monitoring

The graduate assistants followed a set procedure in interacting with subjects. As already described, after a participant had volunteered to be in the study, a diskette, questionnaire, and instruction sheet were sent to that family. The subjects were asked, both at the time of volunteering and on receipt of the materials, to return the completed questionnaire as soon as possible.

If after several weeks nothing had been received, a follow-up call was made to the subjects to ask for the return of the questionnaire, to answer any questions that had arisen, and to encourage use of the diskette. One additional follow-up call was eventually made to those who still did not return the questionnaire. No further contact was made with volunteers who did not respond to this call.

On the instruction sheet received by participants were phone numbers by which the assistants for the study could be reached, as well as an address for mailing materials. Several of the respondants did call during the course of the study, generally to report some type of problem with the data collection diskette. All such problems were immediately resolved, usually by instructing the participants on proper usage, sometimes by replacing a damaged or defective diskette.

Respondants who were members of the Houston Area Apple Users Group (HAAUG) had additional frequent opportunities to interact with the researchers, as the graduate assistants made monthly requests for volunteers at HAAUG meetings. Generally, several participants in the study would spontaneously come up at each meeting to ask questions, make comments, or give suggestions. Generally, participant

statements indicated that they found repeated insertion of the diskette and answering the questions tedious. The assistants were instructed to be attentive to these comments and to ask the participants to continue regardless.

In early August, a postcard was sent to all subjects noting a change in the address and phone numbers by which they could reach the researchers. At the end of August, the first fifty participants were asked by letter to return their diskettes for analysis. Three weeks later, a follow-up phone call was made to those who had not sent back the diskettes. At the end of September, a similar procedure was followed in asking all remaining subjects to return their diskettes.

From early October until early November, all subjects who had not returned diskettes were called at least twice to ask that all materials be sent back. No further contact was made with participants who did not respond to these requests.

Data Analysis Procedures

The two major sources of data in the study are the questionnaires and the data diskettes. The researchers analyzed the information in the questionnaires by summing all the data given under each question to create an overall picture of the sample's response to that item. Also, each family's answers were grouped together to indicate their individual demographic characteristics, method of purchase, and knowledge about personal computers.

By using this approach, the data gathered could be evaluated both for internal interactions among variables (e.g. did families with more computer experience approach the purchasing decision differently) and for generalizations about the entire sample (i.e. the average income of families who purchase home computers). Also, if major differences among families emerged in the analysis of diskette information, the questionnaire data could be grouped to look for correlations in family characteristics. (For example, do all families with distributed patterns of usage among their members also have significantly greater amounts of education about personal computers compared to families in which one member dominated computer usage?)

The retrieval program for diskette data was constructed to produce written versions of the diskette protocol with the subjects' answers inserted. In this manner, the answers could be examined and summed using the same context in which they were given, as if a written questionnaire had been completed. This minimizes the chances of error in assigning a particular answer to a different question.

A content analysis format was used to sum respondents' answers. This protocol provides a means of grouping related sets of questions and answers to simplify subsequent analysis. Also, the very large amounts of data collected on the diskettes are condensed into a form in which patterns of family usage can be more readily identified.

The content analysis format concentrates on the following questions:

--who within the family are the users of the computer, and what percentage of total sessions does each contribute?
--what are the purposes for which the family uses the computer, and which purposes are most significant in terms of frequency?
--how many minutes does the family expect to use the computer, and what discrepency exists between this expectation and actual time in usage?
--for what activities does computer usage substitute?
--to what extent is computer use shared among family members?
--how are situations of competition for the computer handled by the family, and how frequent is this problem?
--how often are difficulties encountered in using the computer?
--do users feel that time spent with the computer is about right, too much (what is displaced), or too little (why was use terminated)?
--what overall feelings and open-ended comments about the computer do users have?

This protocol does not attempt to construct a chronology of computer use over the period during which data was collected. Such conclusions from the diskette data would be suspect, as no means exists of determining how many user sessions were not recorded on the diskette through subjects' failure to insert it. To ensure that the accumulated data for each family was representative of general usage patterns, diskettes with less than ten complete before/after data collections were not included in the analysis. All diskette data was summed for families with more than this minimum number of entries, so the total record of each family's usage was utilized in conducting the analysis.

IMPACT ON FAMILY PATTERNS

The results of the initial written questionnaire indicate that our study is based on data obtained from a highly select population. The respondants all are people who have acquired an Apple II computer and disk drive. They are also people who agreed to participate in this inquiry.

As would be anticipated, our population is largely white, middle class, and relatively well educated. They are thus not representative of the general adult population or of most American families. Although the number of households acquiring home computers has steadily increased, such families still remain in the minority, and households obtaining systems as expensive as the Apple II are a fraction of this group.

On the other hand, this sample of users is not significantly different from many or most American families who have acquired home computers. Moreover, as computer hardware becomes more powerful and prices fall, increasingly families will be purchasing systems at least as powerful as the Apple II. Thus, this sample is representative of what the American family is becoming.

Detailed data about demographic characteristics of the sample or respondents' pre- and post-acquisition behavior is peripheral to the focus of this paper and hence is not included. Some relevent characteristics of the families are that almost two-thirds of respondents listed "professional" as their current occupational status; seventy-three percent had at least a college degree; and eighty-seven percent have continued their education about computers through magazines, courses, users groups, and the like since purchasing their machines.

As described earlier, this study utilized data collecting diskettes as a means of recording participant computer usage. In analyzing the resultant information, two issues are important: how well did this experimental method work as a way of acquiring data, and what was learned about family use patterns. From this knowledge, subsequent researchers both can design improved methodologies and can identify productive hypotheses to study.

Data Collection Method

One of the goals of this study was to assess the utility of an experimental method of recording participant responses on questions related to their day to day activities. Using diskettes to acquire and store information offers many benefits. Such an approach is inexpensive compared to human collection of such data. The computer provides an impersonal, unobtrusive, and unbiased method of

obtaining answers from participants. The considerable trouble of managing large numbers of paper questionnaires is avoided. Subject responses are elicited at the time of their activity on the computer, when the information is fresh in their memories.

The two major potential problems likely to be encountered with this approach are 1) loss of data through subject error or inadvertant damage to the diskette, and 2) the non-collection of data through subjects' boredom or forgetfulness. This research gives a good sense of the magnitude of these possible problems and also indicates ways in which future appplications of this methodology might be designed to minimize their ill effects.

Of the 98 families who agreed to participate in the study, questionnaires were returned by 75 (77 percent) and diskettes by 60 (61 percent). Of these diskettes, 14 were damaged or unused, 19 contained too small an amount of data to analyze, and 27 had usable information. Overall, of all diskettes sent to subjects, 28 percent provided useful data, 34 percent came back without useful data, and 38 percent were not returned. What were the major sources of problems?

About five percent of the sample experienced problems with the diskette and called for assistance. Of these, most were using the diskette incorrectly; a simple explanation over the phone was enough to resolve this situation. In one case, the diskette was defective or was damaged in transit; a replacement diskette was quickly provided.

In using diskettes to collect data, these types of problems occur at the beginning of information storage, when correction of the situation is easy. In none in of these instances was any already stored data lost, so user confusion or faulty materials were not sources of any significant methodological difficulties.

By their direct report, at least ten percent of the sample did either lose the diskette or damage it irreparably before data could be retrieved. (The actual figure is probably somewhat higher because of uncertainty about the situation of those subjects who neither returned diskettes nor reported why they had ceased to participate in the study.) In most cases of damage, the subject accidentally "reinitialized" the diskette (wiped it clean) under the mistaken impression that it was a different diskette.

This is a type of loss more likely to occur with a diskette than with written questionnaires. Unfortunately, the only way to ensure that diskettes are not inadvertantly erased (write-protection) also blocks the storage of any new information on the diskette, so this type of safeguard is impractical. The diskettes in the study were clearly labeled

and were provided with a special container for storage. However, participants in a hurry (especially naive users) could confuse it with a different diskette; such an error is not uncommon with beginning computer users.

All diskettes available when this research began were black and closely resembled each other, so ensuring positive user identification was difficult. Since the initiation of this study, colored diskettes are beginning to appear on the home computer market. Future investigators will be able to use diskettes of an unusual color if they desire. For most users, this should greatly reduce the possibility of accidental erasure or loss.

All the remaining problems with diskettes unreturned or containing only small amounts of data seem to be connected with subjects finding the information entry process boring and unrewarding. Some participants indicated in the open-ended comments they made on the diskette that repeatedly answering the questions was tedious. Others expressed similar feelings when talking with the researchers on the phone or at HAAUG meetings. Still others spontaneously included notes when returning the diskettes; in apologizing for the lack of data, they indicated problems with forgetfulness or disinterest.

The chronological pattern of usage found on many diskettes suggests that, even when usable amounts of data were present, not every session on the computer was logged. Only a handful of respondants seem to have been completely faithful about entering information. Also, some entries have only very sketchy responses, as if the participant were hurrying through an unwelcome chore rather than carefully assessing thoughts and feelings.

Of course, many subjects made entries with care, and the data to be analyzed below reflect a fairly complete record of those families' activities on the computer. The usage patterns found do not suggest that some individuals within families always recorded activities while others never did, thus distorting the data. Instead, either families seem to have used the diskette most of the time or, after the first few weeks, they seem to have ignored it more often than not. Of course, families in this second category provided too little data to be used in our analysis.

Most aspects of this research were designed so as not to require logs of every single session, so the information gathered from active families is quite adequate. However, the overall proportion of subjects' diskettes with usable data is lower than might be hoped, and interrelated factors of tedium and forgetfulness seem primarily responsible.

Ameliorating this problem in future research studies is

likely to be very difficult. To design a diskette that reinforces data entry by playing a game with the user or some similar device both would be expensive and could distort the usage pattern. Paying subjects for their participation might create more motivation to record sessions accurately, but this also would be expensive and would only affect those family members who felt directly benefited. Requesting less frequent usage of the diskette and recording, say, weekly sets of sessions and feelings would vitiate many of the advantages of this methodology without necessarily encouraging more reliable use.

Therefore, no easy answer to improving attrition rate or accuracy in future such research seems apparent. Of course, the use of any other methodology is unlikely to produce higher or more complete response rates; it is doubtful, for example, that filling out numerous paper questionnaires before and after usage would have produced better data. The diskettes seem to be a less expensive methodological approach that has some advantages while retaining a fundamental problem of subject motivation.

Family Usage Patterns

The data on the 27 diskettes with a sufficiently large number of complete entries was condensed using the content analysis format discussed earlier. Below are summarized 1) the results of combining the data across the entire group of families and 2) the patterns which emerged when contrasting families with multiple users of roughly comparable activity levels to families dominated by a single user.

Families were divided into three groups based on their pattern of usage among household members. Those families with one user whose number of sessions was at least four times greater than all other users combined were classified as "single user dominated." Those in which the least active user recorded at least one-third as many sessions as the most active were classifed as "group dispersed." Those with intermediate mixtures of user activity were classified as "intermediate." (Potential users less than five years of age were not included in this classification system.)

The distinction here is clearest for families with more than two potential users (which comprised most of those returning usable diskettes). With any number of potential users, a "single user dominated" family would have at least eighty percent of the computer sessions logged by one person. For a three person family to be classified as "group dispersed," the most active user could log at most sixty percent of total use, with each of the other two family members having twenty percent or more. In a four user household, the highest possible figure for the most active user in a "group dispersed" family would be half of total

activity.

For the 27 families returning usable amounts of data, 16 (59%) were "single user dominated," 4 (15%) were "intermediate" and 7 (26%) were "group dispersed" in their usage pattern. Thus, the majority of families have one member who is quite involved with the computer relative to others in the household.

Of those families who are "single user dominated," in 13 out of 16 cases (81%) the dominant user is male. This is unsurprising given the generally masculine images of computers, mathematics, and science in our culture. Evidently, more than the presence of a computer in the home is required to reduce the gender gap between male and female computer users.

The purposes for which the computer was used in these 27 families were categorized as entertainment, education, work, communications with other computers, word processing, programming, and household management. This information was identified by users in response to a direct question and crosschecked by asking about the software packages used (to see if these were appropriate for the purposes stated). In 18 of the 27 families, more than half the sessions logged were dedicated to one type of computer usage; for the other one-third of the sample, no single application of the computer was dominant.

A breakdown of what proportion of families had at least some computer usage in each of these categories can be given as follows:

entertainment:	67%
education:	52%
work:	33%
communications:	4%
word processing:	67%
programming:	52%
household mgmt:	19%

For the two-thirds of the sample in which one usage was dominant, the major application was:

entertainment:	11%
work:	28%
word processing:	28%
programming:	33%

The major distinction between "group distributed" and "single user dominated" families was that "entertainment" was a much more significant category of usage in "group distributed" households.

If those categories of use most likely related to occupational interests are combined (work, communication with other computers, word processing, programming), the vast majority of the sample's usage falls into this area. This group of computer users seems to focus on their home machine as a tool to aid in business-related concerns. (Of course, one could also use word processing to write letters to friends, so the distinction is not completely clearcut.) Not surprisingly, families with distributed usage patterns are more likely to have entertainment as a significant purpose, since younger users are unlikely to be as interested in vocationally related applications.

The median amount of time all household users expected to spend in a session on the computer was distributed across the 27 families as follows:

15-30 minutes	4%
30-45 minutes	22%
45 minutes - 1 hour	26%
1 - 2 hours	33%
more than 2 hours	15%

(Of course, for each user, session-by-session estimates covered a considerably wider range.) Thus, in about half the families, subjects estimated a typical usage time of one hour or more; the other half of the sample reported average times of 30 - 60 minutes.

When these figures are compared with actual time spent on the computer, the average discrepency between estimated and actual usage per session was distributed across families thus:

discrepency within 10%	4%
10% to 20% more than expected	14%
20% to 30% more than expected	41%
more than 30%	41%

Consistently, users tend to underestimate the time they will spend in a session on the computer.

At the end of each session, users were asked to give their feelings about the amount of time they had just spent on the computer. In 8 of the 27 families, users felt the time spent had been "about right" in eighty percent or more of all sessions. 14 families had users who felt, on average, that the time spent was "too much" or "too little" in half or more of the sessions. In general, these users wanted more time with the computer, listing a wide variety of reasons for why use was prematurely terminated.

The remaining fifth of the families had feelings about time intermediate between these two positions. While most of

the 27 households had users who felt that a few sessions with the computer had consumed too much time, three-fourths of the families wished on balance for more time with the computer rather than less.

Overall, then, users tended to spend thirty minutes to two hours in each session on the computer, to underestimate the amount of time that would be spent, and--in a substantial number of families--to wish frequently that their time on the computer could have been even longer. This desire for more time showed no longitudinal changes over the course of the study; the computer does not seem to decline in attractiveness with increased experience nor do many users seem able to find as much time for computer activities as they desire. No significant differences in time usage or attitudes emerged between "single user dominated" and "group dispersed" families.

15 of the 27 families reported experiencing occasional difficulties when using the computer. For most of these households, problems occured in ten to thirty percent of the sessions logged. "Group dispersed" households were somewhat more likely to report difficulties than "single user dominated" families; presumably, more frequent users spend enough time on the computer to gain expertise in fixing problems. All users were very frustrated whenever problems occured, but at the end of the session still almost always made positive comments about having the computer.

Users were asked for each session what they might be doing instead if the computer were not available. This information is an indication of the activities with which the computer is competing. The categories in which these activities were classified and the percentage of families listing each are:

external socializing	15%
television	93%
hobbies	4%
recreation	15%
eating	4%
sleeping	48%
work or schoolwork	30%
yardwork and housework	37%
reading	56%
exercise	4%
same activity without computer (e.g. typing)	33%

In 14 families (usually "single user dominated"), a single activity was listed as displaced by at least half of the sessions on the computer. In 12 of the 14 cases, this activity was television viewing. No other significant differences were noted between "single user dominated" and

"group dispersed" families.

Thus, the major activities displaced are television, reading, sleeping, and working. All of these are typified by generally low levels of interaction with other family members, so the computer is evidently not significantly decreasing the overall amount of social interaction within families. To the extent that the computer is used for work-related purposes, however, time spent on the machine does seem to be reducing users' leisure activities.

A series of questions on the diskette collected information about family social interactions surrounding access to the computer. First, users were asked if they were beginning the session alone or were sharing the computer with others. In 11 of the 27 families (41%), more than one out of every ten sessions began with multiple users. Not surprisingly, these tended to be families classified as having "intermediate" or "group dispersed" usage patterns. For these eleven families, an average of one-third of all sessions were initiated with multiple users, as compared to an average of three percent over the rest of the sample.

All of this subset of the sample also had other users attempt to join a session on the computer in at least ten percent of all sessions. The average over this group was nineteen percent, compared to three percent of sessions which someone attempted to join for the rest of the sample. For all families, sometimes joining the group using the computer was encouraged, sometimes rejected. Participants' comments gave no indication that significant family problems arose over this decision.

In eight of the eleven families with major levels of social interaction around computer access, other family members sometimes attempted to compete for use of the computer (by asking the person(s) on the machine to terminate their session). Competition for access also occured in three of the other families in the sample. For all these families in which usage was disputed, competition occured in an average of seventeen percent of all sessions. Sometimes those using the computer chose to accede to the wishes of the competitor, sometimes not. Users' comments did not indicate any significant levels of family friction over this decision.

Overall, in families with multiple active users the computer is frequently shared and sometimes not shared. Purposes for which the computer was used during multiple user sessions tended, not surprisingly, to be educational or recreational in nature, since these applications lend themselves more readily to group involvement. Very few families in the sample had so many sessions of multiple person computer usage that the machine could be seen as

causing a major increase in total family interaction.

At the end of answering questions on the diskette, users were asked their overall feelings about having a computer and were given the opportunity to make open-ended comments. All participants were generally enthusiastic about the computer and felt its impact on their lives had been positive. Typically, no other remarks were made.

The researchers contrasted families classified as "single user dominated" with those "group dispersed" to see if significant differences between these groups emerged in the data on the questionnaires. The two groups seem generally similar in all aspects the questionnaire measured (reflecting the generally homogeneous population in the sample). Whatever the factors are which determine the emergence of multiple active users in a family, they were too subtle to be found by exploratory research of this type.

EFFECTS ON FAMILY/SCHOOL INTERACTIONS

An increasing proportion of American families are purchasing and using microcomputers. Over the next few years, these devices may become as common a part of everyday life as the toaster or the dishwasher, another tool around the house. Some family members may use the computer for entertainment, others for education or for business; some will ignore it altogether. However, as computers are used more and more in work, for shopping, and for banking, every family will find having some type of small computer increasingly necessary.

As a result of the microcomputer's attractive attribute of interactiveness, children and adults alike are spending more time and money on these devices than anyone would have predicted even two years ago. In fact, microcomputers are creating a more rapid alteration of people's lifestyles than did the television, the movies, or the radio. For example, videogames are already three times as large an industry as motion pictures!

How each person uses the small computer will shape his or her individual life, and each of us is accustomed to integrating new tools into our lifestyle. But the home computer may also alter family interaction patterns, the ways by which this group of individuals communicates, educates, and forms a network of attachment. Most people do not think about how tools affect their lives at this level and, as a result, the subtle and slow effects of microcomputers on families and schools may be unintended and less than optimal.

Implications for Families

Over the next several years, the current rapid penetration of microcomputers into family life will increase. As a result, some speculate that negative side effects on individuals and families may multiply. Children skip school to go to arcades (a large-scale behavior that television did not evoke). Movies anthropomorphize the computer's role in the person/machine partnership and glorify the reclusive programmer. Using a home computer may not only tend to defer the need for interaction with others (as does the television); it may begin to substitute for interpersonal relations. Of course, all these potential changes would affect the needs a student brings to the school situation and would intensify the challenges already faced by teachers.

The results of our study suggest that--at least so far--these speculations are overly dramatic. A major finding of our research is that personal computers should not be viewed as having analogous impacts on the family to the

television; for many, in fact, the computer is used as a substitute for television viewing. Computers generally seem quite different in the social role they play in the American home (although families with a pattern of single-user, work-related computer activity may find the computer no more desirable in its effects on that individual).

Our respondents did not become "computer junkies" nor did they appear "addicted" to using the personal computer. Users did not seem to attribute significant anthropomorphic qualities to the machine, nor did major emotional entanglements occur between person and computer. Family members did, however, consistently underestimate the amount of time that accomplishing a goal using the computer wuld take; and simultaneously they wished for even more time to spend on the machine.

Most of our sample utilized their home machine as a tool to aid in business-related concerns, using the computer primarily for work, word processing, and programming. Entertainment and education were significant, but secondary applications. (This has implications for those who see major amounts of children's learning becoming home-based in the near future.)

The major activities for which computer usage substituted were television, reading, sleeping, and doing the same work without the computer. Thus, even when the machine is being used by just one person, the activities displaced also involve generally low levels of interaction with other family members. However, time spent on the computer does seem to be reducing some users' leisure activities.

Nor does the personal computer seem to act further to alienate or isolate family members from one another. In about one-quarter of our sample, use of the computer was distributed throughout members of the family, and the machine served as a means for shared experience and communication, across both genders and generations. Competition for computer usage did not seem to be a major issue. In the remainder of families we studied, an individual (usually male) might dominate the use of the computer, but the activities for which that time on the computer substituted were also removed from social interaction, so the net effect was to leave overall communications patterns largely unchanged.

Further, rather than confining the individual, the personal computer can act as a resource for enhancing relationships outside the home. Our respondents frequently become members of a users group, associations which hold fairly regular meetings and sponsor social activities. The personal computer also can provide people with an additional

set of cognitive skills which, in turn, enhance self-confidence, motivation to learn, and social status with peers.

Thus, for at least this small and admittedly selective sample, the personal computer plays a moderate, neutral-to-positive social and psychological role in families. All participants were generally enthused about the computer and felt its impact on their lives had been positive.

So far, the impact of the microcomputer on family education patterns seems relatively minor. Contrary to popular belief, major shifts in the role of the parent in providing assistance with homework; new types of parent/teacher interaction; the extensive use of the machine for remediation, diagnosis, or enrichment; and the substitution of computer-based entertainment for time previously spent on education (or vice versa) all were not changes substantiated by this study. With the emergence of higher quality software for instruction, this situation may well alter.

Our research is not designed to yield results generalizable to all families--that will take a great deal of time and money--but rather to suggest how large and how universal the potential negative and positive effects of computers on families may be. From such preliminary work, more comprehensive research can be designed.

More, larger scale studies of the uses and role of the personal computer in the family do seem warranted by these findings. This preliminary and limited inquiry does suggest evidence of some changes in psychosocial interaction patterns, shifts which in many cases run contrary to popular belief. How families resolve their desire to spend increasing amounts of time using the computer, what factors differentiate families with multiple active users from those with a single dominant user, and how the reduction of some users' leisure time influences their lives are illustrative of the intriguing questions deserving further exploration.

The ultimate goal is to find families who use microcomputers in predominantly constructive ways, strengthening interaction patterns and communication rather than allowing the computer to serve as an unconscious source of alienation and isolation. The positive adaptations these families have made can then serve as a model for guiding equipment manufacturers, software vendors, teachers, and families to design and use computers so that their indirect effects are positive.

Implications for Educators

Educators can do a great deal now to maximize the benefits and minimize the side effects of students using home computers. The list of questions below provides an informal checklist which can be used to watch for potential problems in how the computer is being utilized. Teachers, by presenting the concept of shifting family interaction patterns to students, can help prepare families to use the computer in ways which strengthen interaction and communication. Families and schools which evolve successful models for using computers constructively can share their ideas with others, including researchers such as the authors. From all this, our society can learn not to repeat mistakes made with past technologies.

These are questions which families or groups of students might wish to discuss periodically. They are designed to indicate some of the negative side effects a home computer might create. If a problem is identified, participants in the discussion should be reminded that the computer, because of its flexibility, can also be used as part of the solution.

1. Is your computer used mainly by family members as individuals, or does a family group frequently use the computer simultaneously in a joint activity?

2. Do some members of your family fear or dislike the computer while others are extremely enthusiastic? Can these two groups communicate their feelings to each other?

3. Do the females in your family use the computer significantly less than the males--or vice versa? Do younger, or older, family members dominate use of the machine? (Of course, some members of your family may simply not be interested, but avoiding gender or generation gaps is important)

4. Do any of your family seem "addicted" to the computer (unable to restrict use even when it interferes with other important personal goals)? What might be missing in family interactions for which the computer is substituting?

5. What types of activities are lost when family members spend time on the computer (eating, sleeping, TV, reading, talking)? Overall, does the competition of the computer with these activities decrease family interaction and communication?

6. Is someone in your family "emotionally" involved with the computer (thinking of it as a person, giving it attributes no tool could have,

forming affective bonds of love or hate to the machine)? How can these emotions be displaced onto a more appropriate recipient?

Through interactions with students on topics such as these questions suggest, teachers can help to ensure that home computers do not intensify the already major needs for socialization and human interaction that youngsters bring to the classroom. In addition, as these machines become capable of sophisticated instructional functions, teachers can build home/school partnerships for learning. Long-term, the availability of family computers linked to schools via cable or satellite telecommunications networks may be instrumental in allowing greater cooperation between parents and educators. In brief, these information technologies are opening up new options for instruction.

CONCLUSIONS

Overall, then, families can be changed for better or worse by the subtle, unconscious shifts created through microcomputer usage. Educational interactions within the home, while minimally affected so far, may change in more dramatic ways as more powerful hardware and software become available. Cooperation among teachers, parents, and students will be vital in ensuring that the shifts in learning patterns which take place are optimal.

Reshaping the use of these devices to maximize their benefits to home and school will be far easier now than later. Further research to clarify the evolving impact on personal computers seems important. By gathering solid data and then acting collectively, we can ensure that home computers fulfill their full potential to help create a bright educational future.